

ABSTRACT

Piezoelectric devices made from lightest isotope enriched materials with significantly improved thermal conductivity, frequency stability and phase noise qualities. The isotopically enriched materials may consist of a single crystal and may include silicon dioxide, zinc oxide, titanium dioxide, lithium niobate, lithium tantalate, langasite, langatate, and lead-zirconate-titanate. Piezoelectric devices of greatly improved frequency, and phase and power stability/power handling characteristics are realized for use in RF communications, acoustic wave crystal filters, portable clocks, oscillators, resonators, speakers, ultrasonic speakers, ultrasonic transducers, material inspection, medical diagnostic imaging and non-invasive surgical equipment, and acousto-optic modulators. A method for producing a single crystal of an isotopically enriched material includes the steps of obtaining the isotopically enriched material in powder form, converting the isotopically enriched material powder into dendrite crystals via a first hydrothermal process, and producing a single crystal from the dendrite crystals via a second hydrothermal process.